Bachelor's thesis

Mechanical engineering

Product development

2016

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DOCUMENTATION FOR ORDERING AN INJECTION MOULDING MOULD

TURKU AMK
TURKU UNIVERSITY OF APPLIED SCIENCES

BACHELOR'S THESIS | ABSTRACT

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Mechanical engineering

2016 | 32

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DOCUMENTATION FOR ORDERING AN INJECTION MOULDING MOULD

The objective of this project was to produce a usable documentation to Okartek Oy, to be used when ordering a mould for an injection moulding machine. Documentation included a standard that manufacturers must comply with, a checklist with items that have previously had some issues as well as all new items from the standard and a trial report to be filled when a test run is made for the new mould.

The focus of the project was to make the documents as informative, logical and easy to understand as possible. This was achieved by carefully going through and verifying all the needed information in the documentations, selecting the best possible format for the documents and making the layout as clear as possible.

The project was a success and the new documents will be used by Okartek for all future mould orders.

KEYWORDS:

Injection moulding, Mould, Standard, Plastic, Documentation

OPINNÄYTETYÖ (AMK) | TIIVISTELMÄ

TURUN AMMATTIKORKEAKOULU

Kone- ja tuotantotekniikka

2016 | 32

Jukka Hatakka

DOKUMENTAATIO RUISKUPURISTEMUOTIN TILAAMISTA VARTEN

Tämän opinnäytetyön tarkoituksena oli tehdä käyttökelpoinen dokumentaatio Okartek Oy:lle, käytettäväksi tilatessa ruiskupuristemuottia. Dokumentaatioon kuului standardi, jota muotinvalmistajan tulee noudattaa, tarkistuslista, joka sisältää aiempia ongelmakohtia sekä standardissa määritettyjä uusia kohtia ja koeajoraportti täytettäväksi koeajon yhteydessä.

Työssä keskitytään tekemään dokumenteista mahdollisimman informatiivisia, loogisia ja helppolukuisia. Tämä saavutettiin läpikäymällä sekä tarkistamalla kaikki dokumentteihin tarvittava informaatio, valitsemalla niille paras mahdollinen tiedostotyyppi ja tekemällä niiden asettelusta mahdollisimman selkolukuista.

Projekti onnistui ja uudet dokumentit tulevat olemaan Okartekilla käytössä uusia muotteja tilattaessa.

ASIASANAT:

Ruiskupuriste, Muotti, Standardi, Muovi, Dokumentaatio

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LIST OF ABBREVIATIONS AND FILE ENDINGS

Abbreviation	**Explanation of abbreviation**
UI	User Interface

File endings	**Explanation of file ending**
Docx	Microsoft text document
Html	Web page
Pdf	Portable document format
Pptx	Microsoft PowerPoint presentation
Slddrw	Solidworks drawing
Xlsx	Microsoft Excel table

1 INTRODUCTION

The purpose of this thesis was to produce a standard and its associated documents for Okartek Oy. These documents will be used when ordering a mould for injection moulding machine. The associated documents are a checklist and a trial report form for mould test run. With the new standard, Okartek is looking to get a new mould ready for production faster, with fewer issues that need to be addressed and also to add some features to the mould that are easy to add when it is made but difficult or even hazardous to add afterwards.

The guide that Okartek was previously using was insufficient and outdated. Both old versions of the standard were made by a former employee and they were incomplete collections of current and old data and as such, they were really difficult to read. If the old standards were used, there would always be a risk that the manufacturer of a new mould would misunderstand something and the resulting repair cost for a large mould could be thousands of euros.

Requirements for the new standard were:

- It needs to be accurate, with all the facts checked.
- It needs to be simple and easy to read, as many who will use it will not be native English speakers.
- There has to be many pictures to explain some new requirements and specify dimensions for existing features.
- It has to have some interactivity to clarify some areas, which were hard to explain with a simple picture or text.
- The new standard needs to be informative and encompass all areas with some previous issues and new topics that need to be included with the mould order.
- It needs to be easily printable and the interactivity of the document should not interfere with the clarity of the printed document.
- Articles in the new standard should serve the needs of sales, production and maintenance departments.

Requirements for the associated documents were:

- Both documents need to be extensive enough, so that all required areas are checked and reported by the mould manufacturer.
- Documents need to be fillable and when filled, it should be possible to print them out or save them in electric form.
- They need to be simple and easy to read, as many who will be filling them will not be native English speakers.
- Documents should be included with or attached to the new standard.

2 RESEARCH AND PRODUCING THE DOCUMENTS

The project started in week 18, 2016 with a meeting, where the requirements and schedule were agreed. The schedule was that in week 24, 2016 the clarity of the standard would be ready to be tested with a Chinese mould manufacturer and all documents would be ready before week 28, 2016, when Okartek would start their summer vacations and the whole factory would be closed.

2.1 Research

Two different research needed to be done. The first was interviewing Okartek personnel about what needed to be addressed in the standard and the second research object was, since both the standard and the associated documents needed some functionality, what would be their format.

2.1.1 Interviews

The research was started by interviewing Okartek personnel about their needs for the new standard. Focus was on issues, which could be improved with the new standard. In order to get an extensive picture of which issues the standard needed to address, the personnel interviewed represented different departments of the company. The personnel interviewed were Jani Eriksson, Production Manager; Jari Mäenranta, Managing Director; Heikki Orpana, Technical Manager; Erkki Vanhanen, Plant Service Supervisor; Kari Vanne, Designer and Sami Varjonen, Sales Manager.

Results for the initial interview were:

- Gas release channels need to be detailed for all commonly used plastics.
- Material quality needs to be addressed in the standard.
- Ejector rod finishing needs to be specified.
- A name plate needs to be designed and required from the mould manufacturer.
- Overall minimum finishing of the mould needs to be specified.
- Water circuit diagram is to be required from the mould manufacturer.

- Cavity markings date stamp, recycle stamp and cavity number need to be present in every cavity or there must be a blank placeholder for them.
- Stamps in cavities need to be able to be removed with a push rod from the back of the mould or with a punch from side of the mould.
- Documentation must be delivered as a hardcopy and in electronic form, either on a USB drive or on a CD/DVD.
- Items for the checklist: mould is empty of water and debris, check connectors, water circulation tested and air channels open

It was agreed that the work would start with the initial list and along the way additional items would be added to the list.

2.1.2 Document form selection

The second objective of research was to determine the format for the documents. All documents needed some kind of interactivity. Either they needed to fillable or there needs to be informative popups.

Six different formats were considered for the documents: Microsoft Word text document (.docx), Microsoft PowerPoint presentation (.pptx), Microsoft Excel table (.xlsx), Adobe Acrobat Portable Document Format (.pdf), Solidworks drawing (.slddrw) and a Web page (.html). All of these formats were considered in the following six criteria:

1. **Informativity and ease of use:** How easy it would be for a user to get information from the documents and to access the program needed to read the format.
2. **Interactivity and printability:** What kind of interactive features are possible with the format and how well one is able to print the document with the interactive features on?
3. **Updatability:** How easy it would be to keep the document updated.
4. **Ease of creation:** How easy it is to initially create the documents.
5. **Security:** How difficult it is to accidently change something in the documents.
6. **Appearance:** What kind of visual features are possible with the format.

Formats in the order they were considered, their flaws and advantages.

Table 1. Formats and criteria

Formats considered and criteria						
	Word .doc	PowerPoint .ppt	Excel .xlsx	Acrobat .pdf	Solidworks .slddrw	Web page .html
Informativity and ease of use	+/-	+/-	+/-	+/++	+/--	+/++
Interactivity and printability	+/+	+/-	+/+	+/+	-/+	+/-
Updatability	+	+	+	-	++	-
Ease of creation	+	+	-	-	++	--
Security	-	-	-	++	-	++
Appearance	+	++	+	+	-	+

Microsoft Word text document (.docx)

Microsoft text document was the first program to be considered. It does well on all other aspects except security and ease of use. It is too easy to change something in the document and in addition, the program to open .docx, Microsoft Word, is expensive. As Microsoft Word was the first to be considered, it was also used as a comparison to other formats.

Microsoft PowerPoint presentation (.pptx)

While interactivity aspect is better than with other formats, one is not able to print those out easily. PowerPoint presentation also suffers from the same flaws as Microsoft text document.

Microsoft Excel table (.xlsx)

As a Microsoft program, it suffers from the same flaws as Microsoft Word. In the standard, the interactive points do not line up, so creating it with Microsoft Excel would be difficult.

Adobe Acrobat Portable Document Format (.pdf)

The program used to read .pdf files, Adobe Reader, is free, so it is easy to obtain. Furthermore, security on .pdf files is also great, since generally different programs are used to create and to read the documents. Creating a whole document on Adobe Acrobat is laborious, as the program is not really suited to creating a document, but rather to editing it. Also the UI in Adobe Acrobat is challenging.

Solidworks drawing (.slddwr)

Solidworks is a really expensive program and as such, people using the document cannot be required to have it. No interactivity is possible with a Solidworks drawing. Documents could be easily created and updated with Solidworks.

Web page (.html)

While the web page might be informative and easy to use, creating and updating are too laborious for this format to be considered further.

There wasn't any single format that was good in every aspect, so in the end .pdf was decided as the end format, as it was good in many aspects and it could be created and updated with other tools. The standard would initially be created as a Solidworks drawing and afterwards enhanced with additional pictures, tables from Excel and 3D models from Solidworks. The checklist and the trial report would be created with Excel and made fillable with Adobe Acrobat.

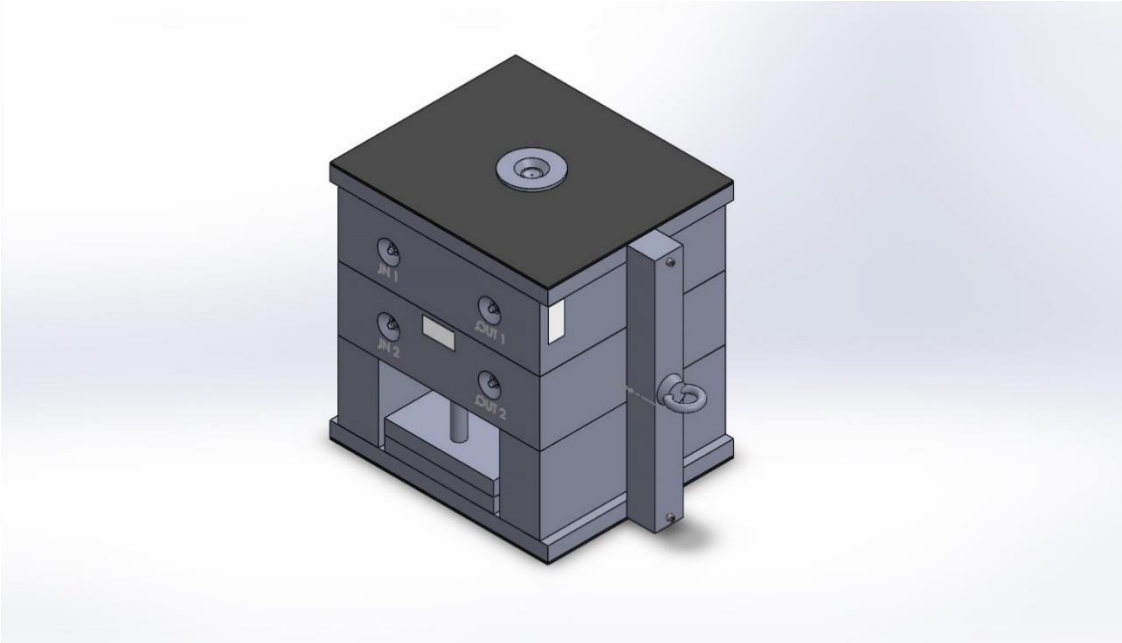
2.2 Creating documents

The standard would by far be the most extensive and important of the documents and it would need several reviews, so it was the first document to be created. In addition, as the standard needed a great amount of information to be included in it and verified, it would be the most laborious document to be created, so the tight schedule of the project also demanded it to be the first of the documents to be started. However, before the standard could be created, a 3D model that would be used in the standard needed

to be designed. After the first version of the standard was done, work with the checklist and the trial report began.

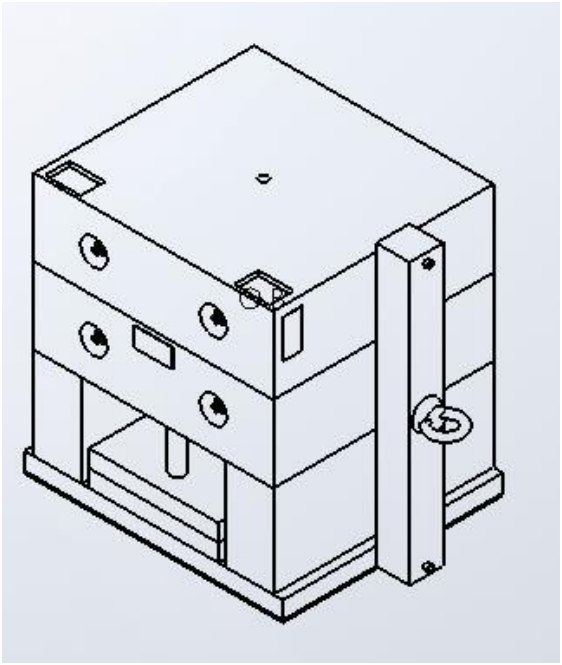
2.2.1 Designing the 3D model

Before creating the standard, a 3D model of a mould mock-up, which would be used to present clarifying views on different topics of the standard, had to be made.



Picture 1. 3D model of a mock-up mould.

The mock-up had to be accurate enough, so that all relevant information could be presented with a single model using different views. In order to present all required information, there had to be three different configurations of the model: one for external views only, one for displaying cavities and some section views and one for depicting air channel dimensions.



Picture 2. Mould mock-up on Solidworks drawing

Clarifying information consists of things such as specifying feature placement, important dimensions and reminders of different standard aspects.

2.2.2 Creating the standard

The first thing to do was to decide on the basic layout of the standard. As a Solidworks drawing is very flexible with layouts, it did not add any constraints, so the layout could be decided purely based on informativity and ease of use. The arrangement of the information on the standard was decided to be as follows:

1. All Major topics and their specifications
2. Dimensions and placement
3. Info on cavities
4. Connections

There also needed to be a title block on every page.

Picture 3. Title block

On the title block, there had to be the Okartek logo, contact information and current page number with the maximum number of pages. Otherwise the title block was designed to be clear and simple.

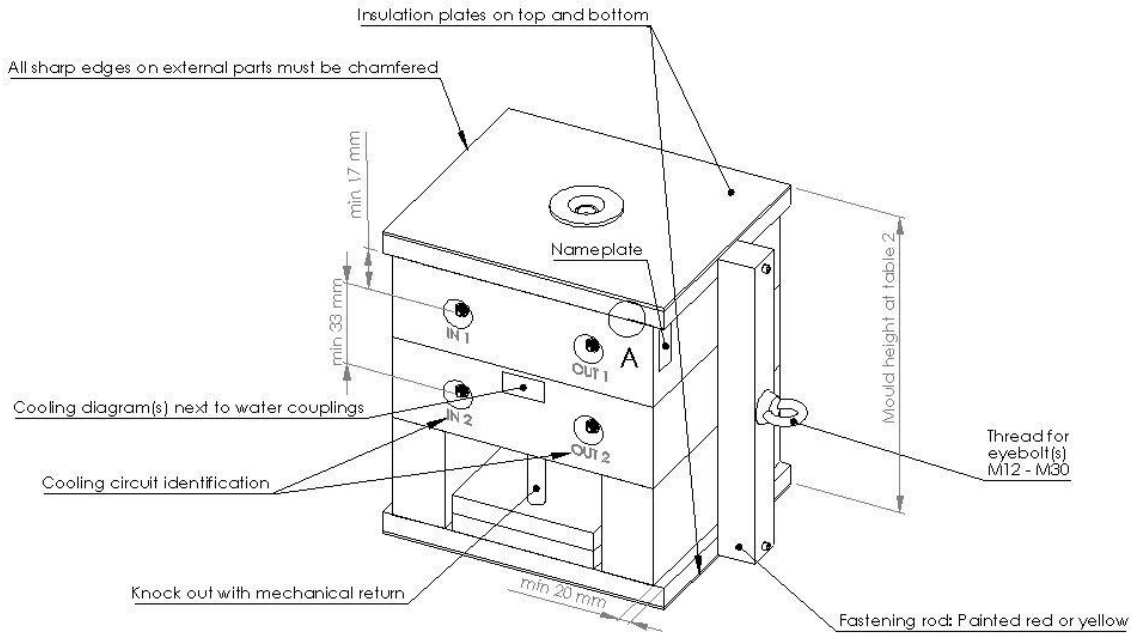
First section – topics and clarifications

In the first section, all major topics on the standard are listed in alphabetical order. With each topic, there are specifications on the subject and a page number where further instructions can be found. Some topics, which do not need any further instructions, can only be found as a text in the first section.

The first section also contains a list of items, which need to be delivered after a test run has been done with a mould, such as product samples from all cavities and a certificate of used materials.

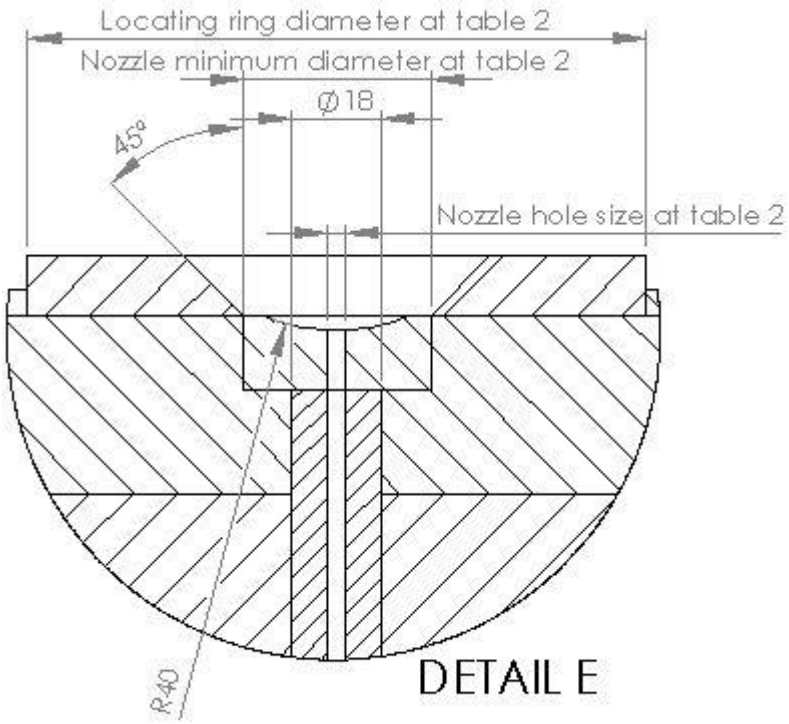
Second section – technical dimensions and feature locations

The second section contains specifications for mould dimensions and feature placement. Information on feature placement is mostly given within clarifying pictures.



Picture 4. Mould mock-up with clarifying specifications.

Clarifying specifications contain items, which would be difficult or laborious to explain with using only words or which depend on mould size or used material, and are easy to explain with a simple picture. Clarifying specifications also contain items, which need to be emphasized, such as the dimensions of the plastic injection nozzle.



Picture 5. Nozzle dimensions

Most of the technical dimensions are gathered in a table as some of them depend on the machine that the mould is designed to be used with.

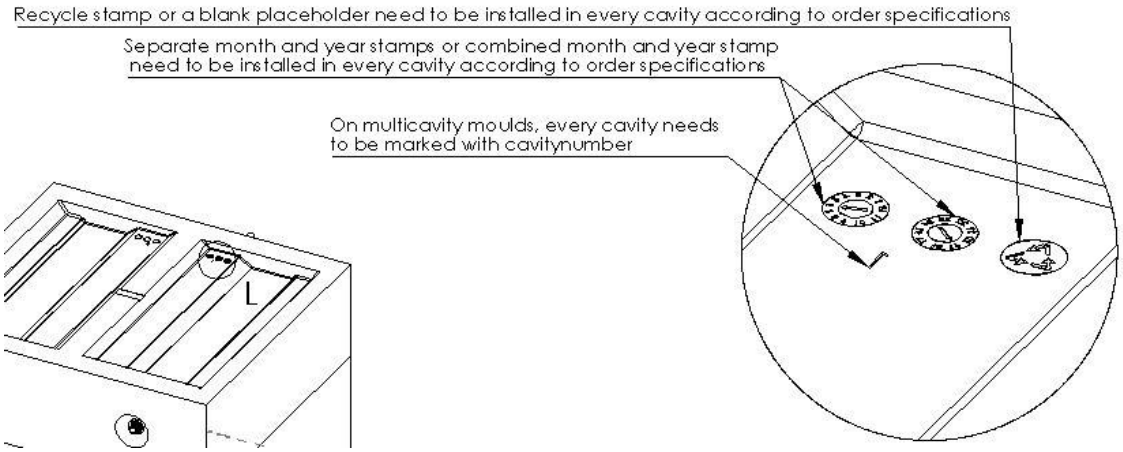
Table 2. Technical dimensions

Table 2								
	Clamping force (tons)							
Mould attribute	< 25	40-60	80-110	150 - 200	200 - 300	400 - 500	550 - 650	1000 - 1300
Mould height min - max (mm)	170-280	220-350	255-400	255-500	310-650	360-770	455-950	510-1400
Mould length max (mm)	300	350	570	750	900	1120	1400	1880
Mould width max (mm)	280	355	400	750	860	900	940	1600
Nozzle radius (mm)	R 40	R 40	R 40	R 40	R 40	R 40	R 40	R 40
Nozzle minimum diameter (mm)	38	38	38	38	38	48	48	48
Nozzle hole size (mm)	2.5	3.0	3.0	3.5	4	4	5	5
Forced ejector pin reset	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ejection plate guides	Graphite	Graphite	Graphite	Graphite	Graphite	Ball	Ball	Ball
Ejector bar thread size (mm)	M 16	M16	M16	M16	M 20	M20	M20	M 20
Locating ring diameter (mm)	100	100	100	125	160	200	200	250
Water couplers must be marked: in 1/out 1, in 2/out 2, etc.	yes	yes	yes	yes	yes	yes	yes	yes

On table 2, there are also listed some items, which are always the same regardless of mould size and this fact needs to be emphasized.

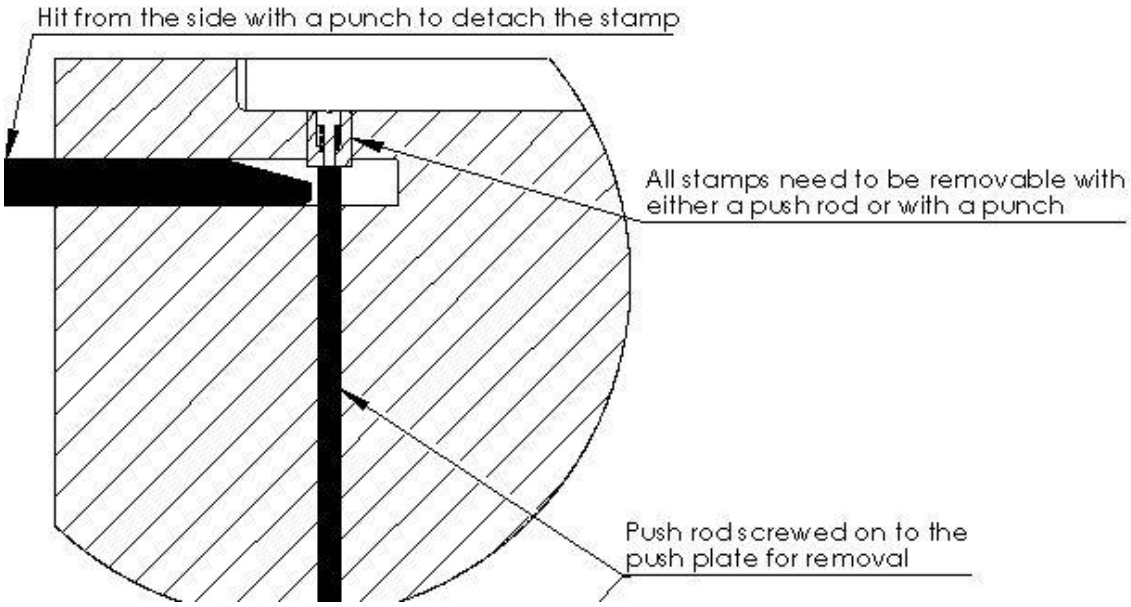
Third section – cavities

The cavities section contains mostly new features that are required from the mould manufacturer in the future. All stamps have previously been required only if the customer specifies that they are needed. However, since they can be extremely laborious and sometimes even hazardous to install afterwards, it was decided that in the future, they are always required to be installed, or at least a hole for them needs to be made with a blank space holder.



Picture 6. Cavity markings.

Depending on the type of the stamp, it might be needed to be replaced yearly, and that can be a very laborious task, so a new feature is introduced to the mould. All stamps need to be removable either with a push rod that can be attached to the push plate or with a punch from the side.

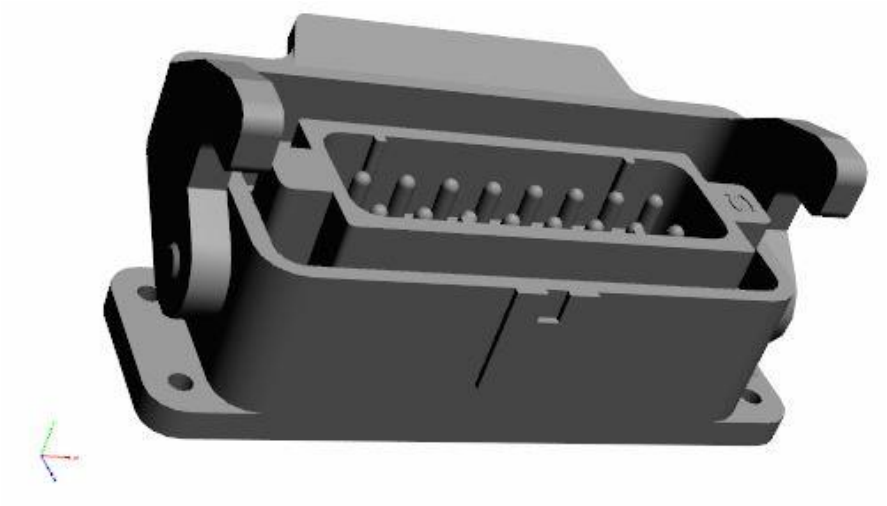


Picture 7. Stamp removal tools.

Also in section three, it is specified that all cavities on a multicavity mould need to be marked with a cavity number. This cavity number is required for quality control.

Fourth section –electrical connectors and fluid couplers

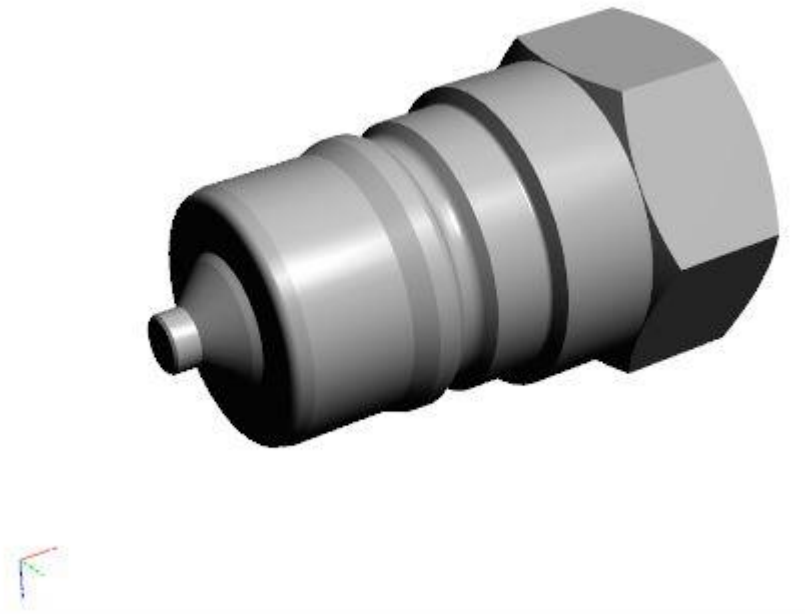
First on section four, there are the specifications for all electrical connectors. Connections are specified on pin by pin basis for all mould sizes. There is also a zoomable and rotatable 3D picture of all electrical connectors for clarity purposes.



Picture 8. Electrical connector 3D model.

Models for electricals were downloaded from Harting page at www.tracepartsonline.net. These 3D models can be rotated by dragging them with a mouse cursor and the user can look at the 3D model from all directions to get an accurate picture of the object. On the lower left corner, each 3D model has a small Cartesian coordinate system with X, Y and Z axis visible to help the viewer to orient the object.

Second on section four, there are specifications of all fluid couplings with clarifying 3D models.



Picture 9. Hydraulic coupler 3D model.

Ready-made versions for some 3D models could be downloaded from the internet and for some, like the hydraulic coupler, only dimensions could be found and a 3D model had to be done according to them. Dimensions for the hydraulic coupler are from www.parker.com. As with 3D models of electrical connectors, these can also be rotated and zoomed to get an accurate picture of the object.

2.2.3 Creating the checklist

Items on the checklist were compiled from the interviews, standard review meetings, a previous outdated version of the checklist and the new standard. All new features are

present on the checklist as a last reminder for the manufacturers of the new requirements. Also on the checklist, there are objects, which need to be checked before shipment. The checklist was initially created as a Microsoft Excel table and converted to its final format as a Portable Document Format by using Adobe Acrobat.

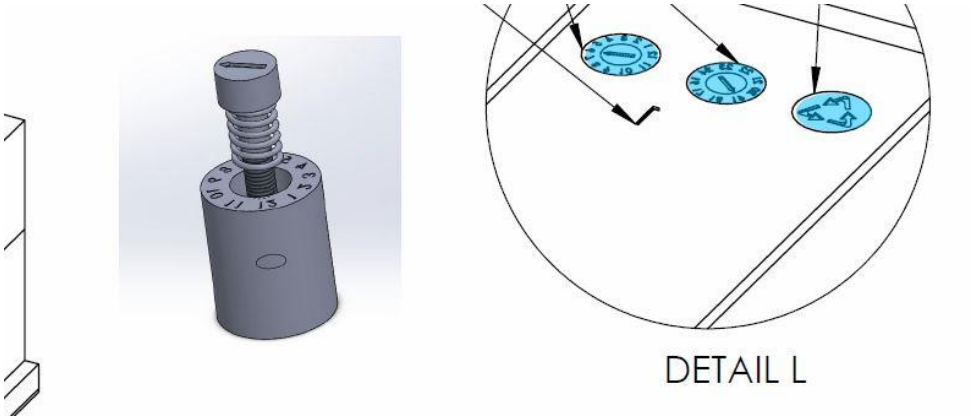
2.2.4 Creating the trial report

The trial report was created by using an old trial report supplied by a Chinese mould manufacturer to Okartek as a basis and adding, changing and taking off items as needed. All changes to the original document were supplied by the Production Manager. As with the checklist, the trial report was also created first as an .xlsx file and then converted to a .pdf with Adobe Acrobat.

2.2.5 Adding interactivity

As the checklist and the trial report only needed to be fillable, adding interactivity to them seemed simple enough but proved to be very tedious. When the document is converted to a fillable form with Adobe Acrobat, it automatically creates fillable fields to empty cells in the document. These fillable fields need to be manually organized to enable logical navigation within the document using tab key.

Interactivity within the standard needed to be more varied. First section needed some links for navigating within the document. These could be done by adding a button over a specific word and linking it to a view within the document. In the first section one can also find links to the attached files, checklist and trial report. At second and third section, some popups with clarifying pictures were added.



Picture 10. Popup picture of month stamp in section 3.

Dimensions for the stamp 3D models are from DME date stamps catalog found at www.m-d-s.co.za

Fourth section needed 3D models of all couplers and connectors. These 3D models were verified by comparing them to parts at Okartek factory. 3D models for fluid couplers were made accurate enough so one cannot mistake them for any other couplers. Threads on fluid coupler models are enlarged and are just for illustrating their position and do not have correct pitch or height.

Picture 11. Water nipple 3D with enlarged threads

The 3D model for the water nipple was downloaded from www.dmeeu.com. Initially, the 3D model did not have threads, so they had to be added later for clarity.

3 CONCLUSION

The standard was a success. The clarity of the standard was tested by taking it along when Okartek personnel visited a Chinese mould manufacturer. For the most part, they found it to be very clear and informative. They suggested some slight changes in wording to increase clarity and those improvements were implemented in the next version. The final version of the standard has been approved by Okartek personnel.

While the checklist and the trial report have not been tested with an external user, they have all the needed information and are logical and easy to navigate and as such, they have also been approved by Okartek personnel.

The interactivity aspect of the documents proved to be very time consuming. Every time some changes were made and the documents were due for another review, all the interactivity had to be redone. For example, when either the checklist or the trial report were updated with Excel and then made fillable again with Adobe Acrobat, all fillable fields would be in a semi random order and one could press tab to navigate Temperature of the hotrunner fields that run from 1 to 24 and end up suddenly after field 8 to the end of the document to field Ejector times and then back to field 12. These fields had to be reordered manually, so that navigating the document with a keyboard would be easy and logical.

As the previous versions of the standard were severely outdated, much time was used fact checking as all details needed to be checked for validity, before they could be added to the new standard.

This project has been a learning experience in producing documentation and also in mould manufacturing. While the standard and associated document are quite short in length, there is large amount of information which needed to be presented clearly and logically, without a possibility to interpret them wrongly. Figuring out how to do this was challenging but in the end all documents came out well.

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Interviews

Jani Eriksson 18 May 2016, [interview]

Jari Mäenranta 11 May 2016, [interview]

Heikki Orpana 11 May 2016, [interview]

Erkki Vanhanen 11 May 2016, [interview]

Kari Vanne 11 May 2016, [interview]

Sami Varjonen 11 May 2016, [interview]

Standard

Okartek Oy mould standard

Open this document with Adobe Reader. 3D models need to be enabled before printing.

All sections of this standard must be followed unless specified otherwise in the mould order.
-Before manufacturing the tool, the 2D/3D drawings must be approved by Okartek.
-Before manufacturing the tool, report from the material hardness test has to be supplied to Okartek
-All standard components **must be based on DME or Hasco standard parts.**
-All sharp edges on external mould parts must be chamfered.

Air channel (page 2):
-Details for different materials on table 1

Bill of materials:
-BOM must be delivered with the mould's technical drawings.

Cavity markings (page 4):
-Separate month and year stamps or a combined month and year stamp needs to be installed in every cavity according to order specifications.
-Recycle stamp or a blank placeholder for it need to be installed in every cavity according to order specifications.
-All stamps need to be removable with either a push rod or a punch.
-On multicavity moulds, every cavity needs to be marked with a cavity number.
-DME or Hasco.

Cooling (page 2):
-Cooling circuits must be identified on the mould by in / out labels and circuit numbers.
-Cooling diagrams must be attached to the mould near the cooling couplers.
-Cooling circuits need to be tested.

Ejector limits:
-IM08-1B5PS-ZC1 DC 10 - 30 V (SICK)

Ejection plate:
-Ball guides on large tools and graphite guides on small tools (table 2).

Electrical connections (page 5):
-All electrical connectors must be screw versions manufactured by Harting.
-Core: HAN 16 A (male) with HAN 16 A housing.
-1 heating point: HAN 6 E (male) with HAN 6 B Housing.
-2 - 3 heating points: HAN 16 E (male) with HAN 16 B Housing.
-4 or more heating points: HAN 16 E with HAN 16 B Housing, separate connectors for heating (male connector) and sensors (female connector).
-All electrical parts must be waterproof.

Eyebolts:
-Eyebolt holes must be on every part weighting over 25kg.
-Eyebolt holes must be drilled on every side of the mould.
-Eyebolts must be placed above the center of mass.
-Parts need to be able to be lifted separately and hang in a horizontal orientation.

Hydraulic connection (page 6):
-ISO 7241-1A compliant coupler with 3/8" threads.

Hydraulic cylinders:
-Short stroke (20 - 50 mm): EOC HZ 260.
-Long stroke (50mm or more): EOC HZ 1605.
-Limits 24VDC pnp.

Insulation plate (page 2):
-Insulation plate is needed on top and bottom.

Multi cavity moulds:
-Multi cavity moulds must have a cavity ID on every cavity.

Name plate (page2):
-Name plate must attached to the mould.
-Example and placement on page 2.

Nitrogen connection (page 6):
-Tema / Threads R 1/4

Sliders:
-If possible, tempering needs to be implemented on sliders.
-Sliders should be heat treated, hardened or nitrided.
-Specifications in tool order.

Usage counter
-Usage counter needs to be installed on the mould

Water couplings (page 6):
-EOC ST 11 / 13 R1/4

Delivered after test run:
-Mould files, if changed
-Cooling diagrams
-Log sheet from test run (attachment). Save as to edit
-Product samples from all cavities
-Checklist, filled (attachment). Save as to edit
-Certificate of used material and hardness test report
-All documents must be supplied as hardcopy and in digital form (CD/DVD or USB flash drive).
-Last payment will be delivered when the mould complies with every part of this standard and the required documents have been supplied.
-Shipping in Zerust Excor bag

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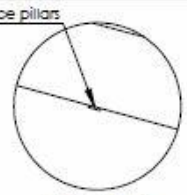
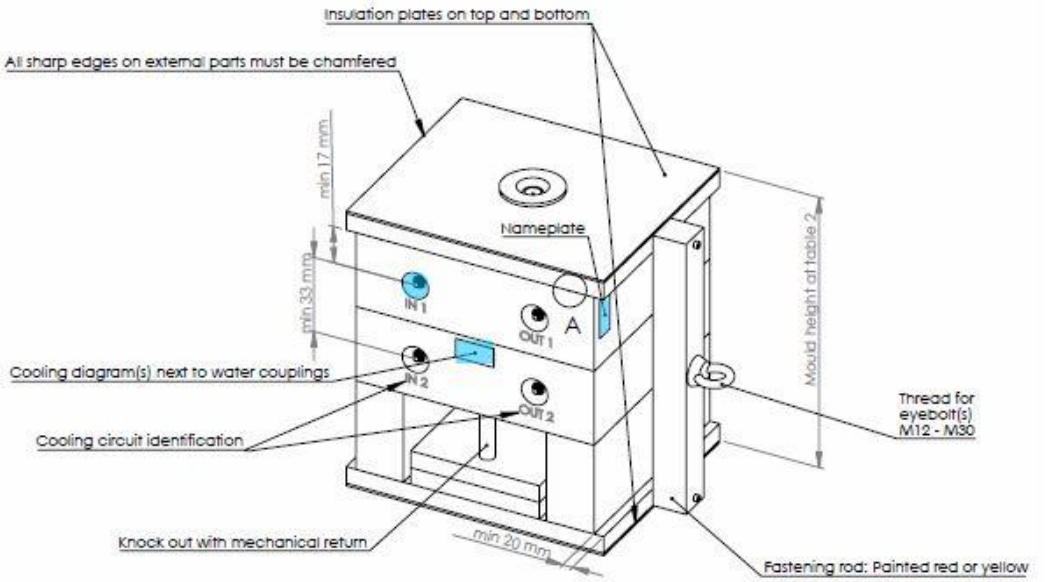
Name plate

Okartek Oy			
Customer:	Abcdefg Hijklmnop	Length (mm):	9999
Product name:	XXXXXXXXXXXXXX	Width (mm):	9999
MFG Date:	MM / YYYY	Height (mm):	9999
Project number:	1234567890	Weight (kg):	99999





Air channed detail
A and B dimensions in table 1

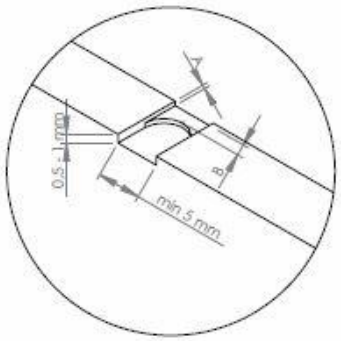


Table 1		
Type of plastic	Depth A (mm)	Length B (mm)
PS	0.02 - 0.04	1.0 - 2.0
ABS, SAN	0.03 - 0.04	1.0 - 2.0
PMMA	0.04 - 0.08	1.0 - 2.0
PC, PC+ABS	0.04 - 0.08	1.0 - 2.0
PE	0.02 - 0.05	0.5 - 1.0
PP	0.01 - 0.02	0.5 - 1.0
PA 6, PA 66	0.01 - 0.025	0.5 - 1.0
PBT	0.01 - 0.03	0.8 - 1.5
POM	0.01 - 0.03	1.0 - 1.5

OKARTEK MOULD STANDARD 2 OF 6

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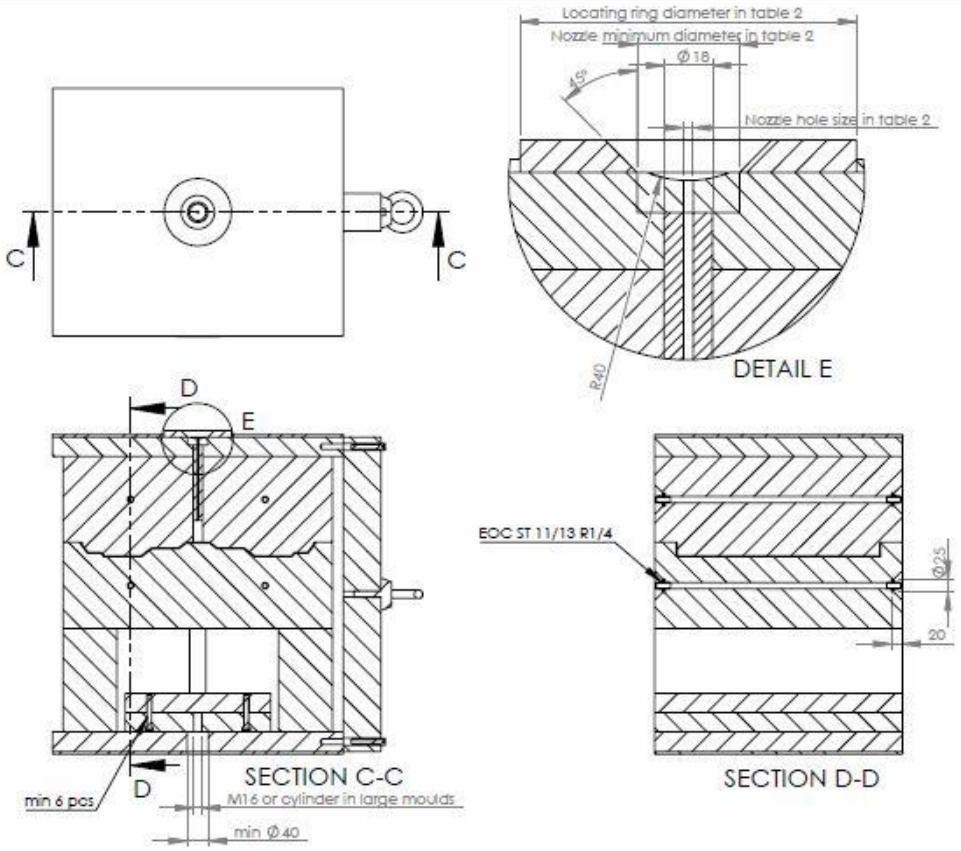

Table 2

Mould attribute	Clamping force (tons)							
	< 25	40-60	80-110	150 - 200	200 - 300	400 - 500	550 - 650	1000 - 1300
Mould height min - max (mm)	170-280	220-350	255-400	255-500	310-650	360-770	455-950	510-1400
Mould length max (mm)	300	350	570	750	900	1120	1400	1880
Mould width max (mm)	280	355	400	750	860	900	940	1600
Nozzle radius (mm)	R 40	R 40	R 40	R 40	R 40	R 40	R 40	R 40
Nozzle minimum diameter (mm)	38	38	38	38	38	48	48	48
Nozzle hole size (mm)	2.5	3.0	3.0	3.5	4	4	5	5
Forced ejector pin reset	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ejection plate guides	Graphite	Graphite	Graphite	Graphite	Graphite	Ball	Ball	Ball
Ejector bar thread size (mm)	M 16	M16	M16	M16	M 20	M20	M20	M 20
Locating ring diameter (mm)	100	100	100	125	160	200	200	250
Water couplers must be marked: in 1/out 1, in 2/out 2, etc.	yes	yes	yes	yes	yes	yes	yes	yes

OKARTEK MOULD STANDARD 3 OF 6

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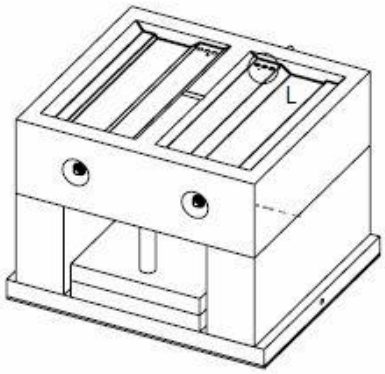
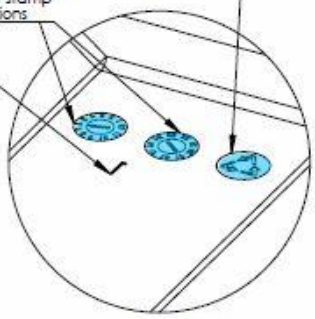
Stamps

A recycle stamp or a blank placeholder needs to be installed in every cavity according to order specifications

Separate month and year stamps or a combined month and year stamp need to be installed in every cavity according to order specifications

On multicavity moulds, every cavity needs to be marked with a cavitynumber

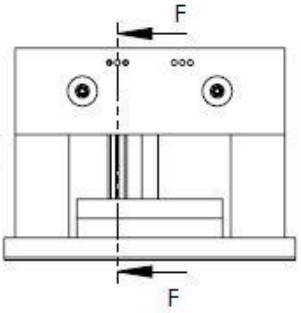




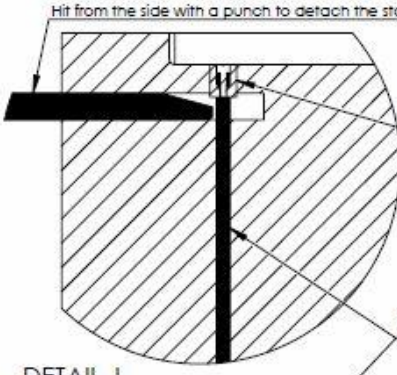
DETAIL L

Hit from the side with a punch to detach the stamp

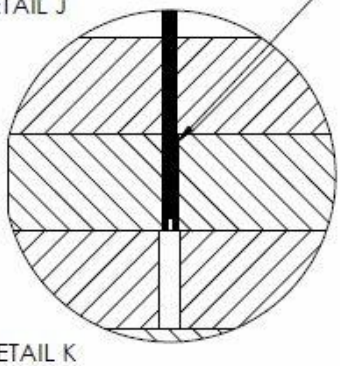
All stamps need to be removable with either a push rod or a punch



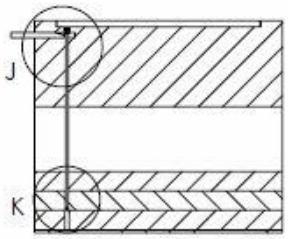
Push rod screwed on to the push plate for removal



DETAIL J



DETAIL K



SECTION F-F

OKARTEK MOULD STANDARD 4 OF 6

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Electrical wirings

Enable 3D to view the pictures.

Core pull
Connector type: Harting HAN 16 A male with HAN 16 A housing.

+24VDC 1	9	core in 1
+24VDC 2	10	core out 1
+24VDC 3	11	core in 2
+24VDC 4	12	core out 2
COM 5	13	ejector prt
COM 6	14	SAW
COM 7	15	
COM 8	16	

Wiring for 1 heating point: HAN 6 E male with HAN 6 B Housing.

sensor +1	4	sensor -
2	5	
heating 3	6	heating

Wiring for 2 - 3 heating points: HAN 16 E male with HAN 16 B Housing.

sensor 1 + 1	9	sensor 1 -
sensor 2 + 2	10	sensor 2 -
sensor 3 + 3	11	sensor 3 -
4	12	
5	13	
heating-1 6	14	heating-1
heating-2 7	15	heating-2
heating-3 8	16	heating-3

Wiring for *4 or more heating points: HAN 16 E with HAN 16 B Housing.*
separate connectors for heating (male connector) and sensors (female connecto

Connector 1- sensors (female)

Sensor 1 - 9	1	Sensor 1 +
Sensor 2 - 10	2	Sensor 2 +
Sensor 3 - 11	3	Sensor 3 +
Sensor 4 - 12	4	Sensor 4 +
Sensor 5 - 13	5	Sensor 5 +
Sensor 6 - 14	6	Sensor 6 +
Sensor 7 - 15	7	Sensor 7 +
Sensor 8 - 16	8	Sensor 8 +

Connector 2- heating (male)

heating-1 1	9	heating-1
heating-2 2	10	heating-2
heating-3 3	11	heating-3
heating-4 4	12	heating-4
heating-5 5	13	heating-5
heating-6 6	14	heating-6
heating-7 7	15	heating-7
heating-8 8	16	heating-8

OKARTEK MOULD STANDARD 5 OF 6

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Fluid couplers

Enable 3D to view the pictures.

Hydraulic connection:
-ISO 7241-1A compliant coupler with 3/8" threads.

Water couplings:
EOC ST 11 / 13 R1/4

Nitrogen connection:
-Tema 2500 ISO G1/4

NOTE: Threads on 3D models are for illustrating their placement and do not have correct profile or pitch.

OKARTEK MOULD STANDARD 6 OF 6

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Checklist

OKARTEK ETOLA YHTIÖT

Mould check list v1.02 19/06/2016

Information						
Product name						
Product weight (kg)			Number of cavities			

Dimensions							
Dimensions of the mould comply with Okartek mould standard							
		Yes	No	Value (mm)	3D	Changed	Notified
Dimensions	X						
	Y						
	Z						

Cavities						
Stamps are even with the surface and work				Cavity numbers present		
	Yes	No		Yes	No	Only one cavity
Month stamp						
Year stamp						
Combined Year and Month stamp				Cavity checked for abnormalities		
				Yes	No	
Recycle stamp						

Markings			
	Yes	No	
Cooling circuit markings comply with Okartek mould standard			
Cooling diagrams located near cooling couplers			
Rating plate located at position indicated at Okartek mould standard			

Other			
	Yes	No	NA
Dimension of the nozzle comply with Okartek mould standard			
Nozzle surface checked for abnormalities			
Ejector tested using the ejector arm			
Ejector holes finished (pins move freely with hand)			
Ejector plate's mechanical return works			
Cylinder ejector works			
Air channels open			
Water circulation checked for leaks			
Water circulation pressure tested one by one (min 5 bar for one minute)			
Casted product(s) is good (no flash, voids or other deformities)			
Electrical connectors comply with Okartek mould standard			
Fluid couplings comply with Okartek mould standard			
Before transport, all cavities are cleared of water and metal chips			

Remarks	

Checked by: _____ Date: _____

Trial report

OKARTEK

FILLABLE TRIAL REPORT 1.05 08/08/2016

Mould and machine information

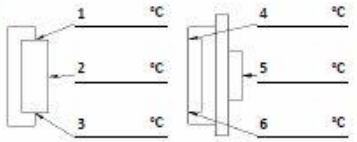
Mould number		Customer		Machine		Dry method	Dry temp. (°C)	Dry time (h)
Resin		Color		Product weight (g)				
Cavity number		Injection sprue Dia. (mm)		Screw diameter (mm)		Weight of transfer (g)		
Trial times		Weight per shot (g)		Injection rate (mm/s)				

Trial type ◯ Scientific moulding ◯ Fit to produce ◯ Only fit for mould trial ◯ Other

Control Temperature

Temperature of cylinder (°C)	Heating zone							Control mould temperature (measurement)
	Nozzle	Z1	Z2	Z3	Z4	Z5	Hopper temp. (°C)	◯ Water ◯ Oil ◯ Bectric
Temperature of hot runner (°C)	1	2	3	4	5	6		

7	8	9	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24



Mould cavity cooling	1:		5:		Mould core cooling	1:		5:
	2:		6:			2:		6:
	3:		7:			3:		7:
	4:		8:			4:		8:

Setting item

Injection		1	2	3	4	5	6	Holding Pressure	1	2	3	4	5	6
Pressure	bar							bar						
	%							%						
Time	(s)							(s)						
Speed	mm/s							Cycle times (s)	Total					
	%							Fill		Holding		Cooling		

Plasticizing	shot volume		P.B.position		back pressure		Screw (rpm)	
	decomp after pl.		cushion		Time		Clamp force (metric ton)	

Mould Parameter

Mould thickness (mm)		Mould size	Length (mm)		Width (mm)	
Ejector force (KN)		Ejector times		Ejector stroke (mm)		Return method

			1	2	3		1	2	3
Core settings	Pull core	Speed				Push core	Speed		
		Pressure (bar)					Pressure (bar)		

Remark:

Reporter: _____ Date: _____ Approved by: _____ Date: _____